

**WE CLAIM:**

1. In a data-over-cable system, a method for estimating an initial transmit level for a cable modem to range on an upstream channel, the upstream channel carrying data transmissions from a plurality of cable modems to a cable modem termination system at a head-end of a cable network, the method comprising the steps of:
  - 5 ascertaining a characteristic value for the data-over-cable system, wherein the characteristic value is associated with configuration parameters for the data-over-cable system;
  - measuring a signal level of a downstream channel at the cable modem, wherein the downstream channel carries signals from the head-end to the plurality of cable modems; and
  - 10 setting the initial transmit level to a difference between the characteristic value and the signal level of the downstream channel,

whereby the cable modem begins ranging at the initial transmit level and is recognized by the cable modem termination system with fewer attempts than if the cable modem began ranging at a minimum specified transmit level.

- 2. A computer readable medium having stored therein instructions for causing a central processing unit to execute the method of Claim 1.
- 3. The method of Claim 1 wherein the ascertaining step comprises:
  - receiving a message on the cable modem from the cable modem termination system, wherein the message contains the characteristic value.

4. The method of Claim 3 wherein the characteristic value is a combination of the configuration parameters selected from a group consisting of a setup upstream input level, a setup downstream output level for the lowest channel, a frequency differential, or a margin.

5. The method of claim 3 wherein the message is an Upstream Channel Descriptor message.

6. The method of Claim 1 wherein the ascertaining step comprises the steps of: receiving a message on the cable modem from the cable modem termination system, wherein the message contains the configuration parameters; and calculating the characteristic value from the configuration parameters.

7. The method of Claim 6 wherein the configuration parameters are selected from a group consisting of a setup upstream input level, a setup downstream output level for the lowest channel, a frequency differential, or a margin.

8. The method of claim 6 wherein the message is an Upstream Channel Descriptor message.

9. The method of Claim 1 wherein the ascertaining step comprises: retrieving the characteristic value from memory in the cable modem.

10. In a data-over-cable system, a method for adjusting an initial transmit level for a cable modem to range on an upstream channel, the upstream channel carrying data transmissions from a plurality of cable modems to a cable modem termination system at a head-end of a cable network, the method comprising the steps of:

5 receiving an implementation delta value on the cable modem in a message from the cable modem termination system, wherein the implementation delta value represents a dynamical correction to the initial transmit level that is responsive to changes in the data-over-cable network; and

10 adjusting the initial transmit level by adding the implementation delta value, whereby the cable modem begins ranging at the adjusted initial transmit level and is recognized by the cable modem termination system with fewer attempts than if the cable modem began ranging at a minimum specified transmit level.

11. A computer readable medium having stored therein instructions for causing a central processing unit to execute the method of Claim 10.

12. The method of Claim 10 wherein the message is an Upstream Channel Descriptor message.

13. The method of Claim 10 wherein the message is a Bandwidth Allocation MAP message.

14. The method of Claim 10 further comprising:

undergoing an initial ranging phase, wherein the cable modem repeatedly transmits to the cable modem termination system with a stepwise increase in signal level beginning with the initial transmit level and ending at a final transmit level when the cable modem receives an acknowledgment;

5 providing a difference between the final transmit level and the initial transmit level to the cable modem termination system,

whereby the cable modem termination system receives the difference from the cable modem and combines the difference with difference values from the plurality of cable modems  
10 to update the implementation delta value.

15. The method of Claim 14 wherein the providing step comprises:

storing the difference in a Management Information Base on the cable modem, wherein entries in the Management Information Base are able to be read by the cable modem termination system.

5 16. In a data-over-cable system, a method for improving ranging of a plurality of cable modems on an upstream channel, the upstream channel carrying data transmissions from the plurality of cable modems to a cable modem termination system at a head-end of a cable network, the method comprising the step of:

sending configuration information in a message from the cable modem termination system to the plurality of cable modems, wherein the configuration information is combined with a signal level for downstream transmissions as measured by a cable modem to provide an estimate for an initial transmit level for the cable modem during ranging.

10 whereby the cable modem begins ranging at the initial transmit level and is recognized by the cable modem termination system with fewer attempts than if the cable modem began ranging at a minimum specified transmit level.

17. A computer readable medium having stored therein instructions for causing a central processing unit to execute the method of Claim 16.

18. The method of Claim 16 wherein the configuration information are configuration parameters selected from a group consisting of a setup upstream input level, a setup downstream output level for the lowest channel, a frequency differential, or a margin.

19. The method of Claim 16 wherein the configuration information is a characteristic value which is a combination of configuration parameters selected from the group consisting of a setup upstream input level, a setup downstream output level for the lowest channel, a frequency differential, or a margin.

5  
20. The method of Claim 16 wherein the message is an Upstream Channel Descriptor message.

21. In a data-over-cable system, a method for improving ranging of a plurality of cable modems on an upstream channel, the upstream channel carrying data transmissions from the plurality of cable modems to a cable modem termination system at a head-end of a cable network, the method comprising the steps of:

5 ascertaining an implementation delta value on the cable modem termination system from difference values provided by the plurality of cable modems; and

sending the implementation delta value in a message from the cable modem termination system to the plurality of cable modems, wherein the implementation delta value is combined with an initial transmit level for the cable modem during ranging to adjust the initial transmit  
10 level,

whereby the cable modem begins ranging at the adjusted initial transmit level and is recognized by the cable modem termination system with fewer attempts than if the cable modem began ranging at a minimum specified transmit level.

22. A computer readable medium having stored therein instructions for causing a central processing unit to execute the method of Claim 21.

23. The method of Claim 21 wherein the ascertaining step comprises the steps of:  
receiving the difference values on the cable modem termination system from Management Information Bases in the plurality of cable modems; and  
calculating the implementation delta value from the difference values.

5 24. The method of Claim 23 wherein the calculating step comprises the steps of:  
searching through the difference values to find a maximum value; and  
setting the implementation delta value equal to the maximum value.

25. The method of Claim 23 wherein the calculating step comprises the steps of:

averaging the difference values to obtain an average difference value; and  
setting the implementation delta value equal to the average difference value.

5        26. The method of Claim 21 wherein the message is an Upstream Channel Descriptor  
message.

27. The method of Claim 21 wherein the message is a Bandwidth Allocation MAP  
message.

28. In a data-over-cable system, a method for estimating an initial transmit level for a  
cable modem to range on an upstream channel, the upstream channel carrying data transmissions  
from a plurality of cable modems to a cable modem termination system at a head-end of a cable  
network, the method comprising the steps of:

5        receiving an Upstream Channel Descriptor message on the cable modem from the cable  
modem termination system, wherein the message contains a characteristic value associated with  
configuration parameters for the data-over-cable system;

measuring a signal level of a downstream channel on the cable modem, wherein the  
downstream channel carries signals from the head-end to the plurality of cable modems;

10        setting the initial transmit level to a difference between the characteristic value and the  
signal level of the downstream channel;

receiving an implementation delta value on the cable modem in a Bandwidth Allocation  
MAP message from the cable modem termination system, wherein the implementation delta

value represents a dynamical correction to the initial transmit level that is responsive to changes

15 in the data-over-cable network; and

adjusting the initial transmit level by adding the implementation delta value,

whereby the cable modem begins ranging at the adjusted initial transmit level and is recognized by the cable modem termination system with fewer attempts than if the cable modem began ranging at a minimum specified transmit level.

20

29. A computer readable medium having stored therein instructions causing a central processing unit to execute the method of Claim 28.

30. In a data-over-cable system, a method for improving ranging of a plurality of cable modems on an upstream channel, the upstream channel carrying data transmissions from the plurality of cable modems to a cable modem termination system at a head-end of a cable network, the method comprising the step of:

5 sending a characteristic value in an Upstream Channel Descriptor message from the cable modem termination system to the plurality of cable modems, wherein the characteristic value is combined with a signal level for downstream transmissions as measured by a cable modem to provide an estimate for an initial transmit level for the cable modem during ranging;

receiving difference values on the cable modem termination system from Management

10 Information Bases in the plurality of cable modems;

calculating an implementation delta value from the difference values; and

sending the implementation delta value in a Bandwidth Allocation MAP message from the cable modem termination system to a cable modem, wherein the implementation delta value

is combined with an initial transmit level for the cable modem during ranging to adjust the initial  
15 transmit level,

whereby the cable modem begins ranging at the adjusted initial transmit level and is  
recognized by the cable modem termination system with fewer attempts than if the cable modem  
began ranging at a minimum specified transmit level.

31. A computer readable medium having stored therein instructions causing a central  
processing unit to execute the method of Claim 30.

32. The method of Claim 30 wherein the calculating step comprises:  
averaging the difference values to obtain an average value; and  
setting the implementation value equal to the average value.